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REMARKS

Claims 18-30 and 38-56 are pending in the present application. In the Office Action mailed August 16, 2004, the Examiner rejected claims 19 and 38-56 under 35 U.S.C. §112, first paragraph. Claims 38-40, 42-46, 50, 53, and 56 were rejected under 35 U.S.C. §102(b) as being anticipated by Hsieh (USP 5,818,896). Claims 18-27, 29, and 55 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hsieh and further in view of Toth et al. (USP 6,115,487). Claims 28 and 41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hsieh and Hsieh in view of Toth et al., respectively. Claims 51 and 52 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hsieh. Claim 30 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hsieh in view of Toth et al. and further in view of Gordon et al. (USP 5,481,828).

Claims 18, 28, 38, and 41 were objected to because of certain informalities.

Claim Objections

The Examiner objected to claims 18 and 38 as having an unclear connection "between the step of determining a helical artifact index and the preceding steps -- for example, how does the HAI follow from the comparing step?" Office Action, para. 1. Claims 18 and 38 are believed to be novel and patentable. The patentability of Applicant's invention lies in each and every element as recited therein and not in any specific connection or interrelation therebetween unless so indicated. Therefore, claims 18 and 38 clearly indicate that which Applicant claims as the invention. Notwithstanding, Applicant has amended claim 38 to call for determining a helical artifact index (HAI) from the comparison.

The Examiner also objected to claim 38 stating that "[c]laim 38 is directed to a method for generating a helical artifact score, however steps for generating such a score have not been set forth." Id. Applicant is unclear how the Examiner reached such a conclusion. The elements of the claim set forth how the artifact score is generated. As such, Applicant requests withdrawal of the objection.

The Examiner further objected to claims 28 and 41 stating that "[c]laims 28 and 41 stating that pixels are identified within a range of '+/- 40 CT numbers' is [sic] consistent only if the imaging device is a CT scanner and would be inconsistent with

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another type of imaging device." *Id.* Claims 28 and 41 are dependent claims that further define the claims from which they depend. More particularly, by rule, a dependent claim is considered narrower in scope than a claim from which it depends. The Examiner, however, has read in the limitation of dependent claims into independent claims. While "CT number" would certainly imply a CT system, claims 18 and 38, from which claims 28 and 41 depend, respectively, are not limited to CT systems or CT technology. Moreover, the doctrine of claim preclusion would mandate that claims 18 and 38 cannot be read to be limited to CT. Therefore, no correction is believed needed.

Claim Rejections under 35 U.S.C. §112

The Examiner rejected claims 38-56 under 35 U.S.C. §112, first paragraph. The Examiner stated that "[a] method for generating a helical artifact index without a phantom and a CT scanner . . . which is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure." Office Action, para. 2. More specifically, the Examiner stated that "[t]he specification sets forth determining a helical artifact index (HAI) based on acquiring and processing image data of a phantom" *Id.*

MPEP §2163 states that "[t]he examiner has the initial burden, after a thorough reading and evaluation of the content of the application, of presenting evidence or reasons why a person skilled in the art would not recognize that the written description of the invention provides support for the claims." A phantom is not described in the specification as being critical to the invention. However, claim 38 calls for, in part, acquiring imaging data of a subject. The Examiner has not presented evidence why a person skilled in the art would not recognize that a phantom is a subject from which imaging data may be acquired.

Further, the Examiner stated that "*helical* artifacts arise from patient translation in a z direction during gantry rotation MRI, PET and ultrasound imaging systems do not have rotatable gantries." *Id.* (emphasis in original). A CT scanner is not described in the specification as being critical to the invention. The Examiner has not presented evidence why a person skilled in the art would not recognize that the invention as called for in claims 38-56 can apply to an image acquired from MRI, PET, or ultrasound

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imaging systems. The invention as called for in claims 38-56 is not restricted or limited to images containing helical artifacts and can be applied to any imaging data including a plurality of pixels. One skilled in the art would recognize and appreciate that the invention is applicable to MRI, PET and ultrasound imaging systems since imaging data including a plurality of pixels may be acquired therefrom.

The Examiner rejected 19 under 35 U.S.C. §112, first paragraph, stating that "[t]he specification does not adequately teach how to determine or use a *helical artifact index* for MRI, PET or ultrasound scanners." Office Action, para. 3 (emphasis in original). One skilled in the art would recognize and clearly understand that the invention as called for in claim 19 can be applied to images acquired on MRI, PET, or ultrasound scanners. The Examiner has not presented evidence why a person skilled in the art would not recognize that the invention as called for in claim 19 can apply to an image acquired from MRI, PET, or ultrasound imaging systems. A CT scanner is not critical or essential to the practice of the invention.

Nevertheless, Applicant has amended claims 18 and 38 to remove reference to "helical."

Claim Rejections under 35 U.S.C. §102

The Examiner rejected claims 38-40, 42-46, 50, 53, and 56 under 35 U.S.C. §102(b) as being anticipated by Hsieh. Applicant respectfully disagrees.

MPEP section 2131 states that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." The Examiner stated that "Hsieh teaches methods and software for obtaining a helical artifact index comprised of a ratio, or comparison, of a first set of image data with helical weighting ('mask') with a second set of image data without helical weighting." Office Action, para. 4. However, Hsieh does not teach partitioning the plurality of pixels of imaging data into a first set and a second set and initializing the first set to a base value as called for in claim 38.

Specifically, Hsieh teaches "a standard deviation ratio of data processed with [the] weighting schemes and without [the] weighting schemes" referred to as a noise ratio. Col. 5, lns. 16-27. Filter coefficients are generated in accordance with the noise ratio and

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are used in the filtering, or smoothing, so that a substantially uniform noise distribution results in a 3D or Maximum Intensity Projection (MIP) image. See Hsieh, col. 5, lns. 55-64. Hsieh teaches that the standard deviation ratio is identified from an image reconstructed with helical weighting and an image without helical weighting. See col. 2, lns. 36-39 and col. 5, lns. 16-27. Hsieh does not teach that the standard deviation ratio is identified from an image partitioned into a first set and a second set as called for in claim 38. That is, the standard deviation ratio is not determined from two sets of pixels partitioned from the scanned image. Rather, the standard deviation ratio is determined from two reconstructed images, each reconstructed image containing all the pixels of the scanned image. Therefore, the standard deviation ratio is not taught in Hsieh to be determined from an image partitioned into two sets of pixels and initializing one set to a base value.

Further, Hsieh teaches that the filter coefficients may be determined on the basis of the data segmented into "smoothed data" and "non-smoothed data" prior to execution of the smoothing algorithm to substantially maintain image resolution. See col. 5, ln. 65-col. 6, ln. 30. Hsieh teaches that "[t]he 'non-smoothed data' . . . are excluded from the determination of filter coefficients" Id. The segmenting, or partitioning, of the data is used to determine the filter coefficients "on the basis of only the 'smoothed data'." Id. Hsieh does not teach that either of the "smoothed data" or "non-smoothed data" segments is initialized to a base value as called for in claim 38.

The Examiner stated that "Hsieh also teaches processing the weighted image data to obtain 3D and MIP images by assigning maximum pixel, or base, values (col. 2 lines 5-12)." Office Action, para. 4. Hsieh teaches "a direction of forward projection is determined and a maximum pixel value along each forward projection ray is identified. The projection value is then assigned to this maximum pixel value." Col. 2, lns. 9-12. The maximum pixel value is not used to initialize one set of pixels to a base value. Instead, Hsieh teaches assigning a maximum pixel value to a projection value -- not assigning a maximum pixel value to a first set of pixels.

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For at least these reasons, Applicant believes claim 38 is patentably distinct from the art of record. Accordingly, claims 39-56 are in condition for allowance at least pursuant to the chain of dependency.

Claim Rejections under 35 U.S.C. §103

Claims 18-27, 29, and 55 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hsieh and further in view of Toth et al. The Examiner stated that "Hsieh differs from the claimed invention in that a phantom is not addressed." Office Action, para. 5. To establish a prima facie case of obviousness, "[f]irst, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." MPEP §2143. Neither the references nor the knowledge generally available to one skilled in the art would suggest or motivate combining the prior art.

Hsieh teaches "a system for reducing noise artifacts in three-dimensional image reconstruction using data acquired in a helical scan." Hsieh, Abstract. Hsieh teaches identifying a standard deviation ratio to generate filter coefficients that are applied to the data in an adaptive smoothing algorithm. Id. The standard deviation ratio is identified from "data processed with the weighting schemes and without the weighting schemes" Hsieh, col. 5, lns. 16-19. Toth et al. teaches "[a] spectral correction algorithm for correcting dense object-induced spectral artifacts" Toth, Abstract. Toth et al. teaches that "a calibration object, representative of typical head scanning conditions is scanned and the data reconstructed to provide an image. A water or water-equivalent cylinder ... also is scanned and reconstructed, on the same display field of view (DFOV)." Col. 1, ln. 65 to col. 2, ln. 3. The correction algorithm as taught by Toth et al. "eliminates, or at least substantially reduces, bone-induced spectral artifacts." Col. 2, lns. 64-66.

There is no suggestion or motivation in either Hsieh or Toth et al. to combine the teachings of Hsieh with the teachings of Toth et al. Hsieh teaches a system for reducing noise artifacts, and Toth et al. teaches a correction algorithm for reducing bone-induced spectral artifacts. Neither reference teaches or suggests a combination with the teachings of the other. Further, one skilled in the art would not be motivated to combine Hsieh,

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which teaches a system for reducing noise artifacts, with Toth et al., which teaches a spectral correction algorithm for correcting dense object-induced spectral artifacts.

Second, "there must be a reasonable expectation of success." MPEP §2143. The Examiner stated that "[i]t would have been obvious at the time the invention was made to a person of ordinary skill in the art to use a phantom as taught by Toth et al. in the invention as taught by Hsieh to correct for noise specifically attributed to helical scanning . . . so as to allow for more focused and appropriate correction/calibration of helical noise." Office Action, para. 5. Applicant does not disagree that CT systems may be used to image a phantom; however, Hsieh neither teaches nor suggests that a phantom could be used in a noise reduction scheme. As such, the Examiner has not shown sufficient evidence to satisfy the second prong of the prima facie case of obviousness.

The third prong of a prima facie case of obviousness requires that the prior art references, when combined, "must teach or suggest all the claim limitations" MPEP §2142. Claim 18 calls for, in part, isolating a first set and a second set of pixels and setting one of the first set and the second set to an initial value. Neither Hsieh nor Toth et al. teach or suggest isolating a first set and a second set of pixels and setting one of the first set and the second set to an initial value.

As described above, Hsieh teaches assigning a maximum pixel value; however, the maximum pixel value is not used to initialize one set of pixels to an initial value as called for in claim 18. Hsieh teaches "a direction of forward projection is determined and a maximum pixel value along each forward projection ray is identified. The projection value is then assigned to this maximum pixel value." Col. 2, lns. 9-12. The maximum pixel value is not used to set one set of pixels to an initial value. Instead, Hsieh teaches assigning a maximum pixel value to a projection value -- not assigning a maximum, or initial, pixel value to a first or second set of pixels as called for in claim 18.

Toth et al. fails to teach or suggest setting one of the first set of pixels and the second set of pixels to an initial value as called for in claim 18. As described above, Toth et al. teaches that a calibration object and a water or water-equivalent cylinder are scanned, and the data reconstructed to provide an image. See col. 1, ln. 65 to col. 2, ln. 3. Neither of the scans of the calibration object or water-equivalent cylinder is taught in

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Toth et al. to be set to an initial value as called for in claim 18. Toth et al. fails to teach or suggest setting a set of pixels to an initial value.

Furthermore, neither Hsieh nor Toth et al. teach or suggest determining an artifact index (AI) and visually displaying the AI on a console as called for in claim 18.

Thus, the Examiner has failed to establish a prime facie case of obviousness of the prior art over claim 18. The three criteria for establishing a prime facie case of obviousness have not been met. For at least these reasons, Applicant believes claim 18 is patentably distinct from the art of record. Accordingly, claims 19-30 are in condition for allowance at least pursuant to the chain of dependency.

Conclusion

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 18-30 and 38-56.

Applicant appreciates the indication that claims 47-49 are allowable.

Applicant appreciates the Examiner's consideration of these Amendments and Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

Respectfully submitted,

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